

Western Snowy Plovers and California Least Terns on Rancho Guadalupe Dunes Preserve, Guadalupe CA 2015 Final Report



Prepared for:

**The County of Santa Barbara
Santa Barbara, California
and
The U.S Fish & Wildlife Service**

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January 21, 2016

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This report summarizes 2015 breeding season monitoring of western snowy plovers (WSP's, snowy plovers, plovers) and California least terns (CLT's, least terns, terns) on Rancho Guadalupe Dunes Preserve (RGDP), a Santa Barbara County Park. The Park is owned and operated by the County of Santa Barbara. Monitoring was conducted by Melissa Kelly (Assistant Naturalist/Ranger II, Recovery Permit # TE-54710A-0).

Abstract

Snowy plovers were monitored between March 1 and August 30, 2015. Seventy-six field surveys were conducted. Sixty-two snowy plover nests and no least tern nests were discovered. The first known snowy plover nest was initiated on approximately 25 March and the last on 24 July. The fates of 61 nests were determined: 31 hatched at least one chick, 26 were lost to predators, 2 were abandoned, 0 nests were lost to surf wash, 1 nest was buried by high winds, and there were 2 nests for which the fate could not be determined since all evidence was erased by wind. The first known hatch occurred on approximately 3 May and the last on 12 August. At least 82 chicks hatched from the 31 successful nests. The earliest expected fledge date for 2014 chicks was 31 May and the last fledging was expected to occur about 9 September. Only 6-7 least terns were seen on the Preserve this year.

Introduction

Western snowy plovers (*Charadrius nivosus nivosus*) (Cassin, 1858) inhabit coastal sand beaches along the Washington, Oregon, California, and Mexico coastlines, and suitable inland habitat at alkaline lakes, ponds and river bars in the western states (Page et.al., 1995). The U.S. Fish and Wildlife Service designated the Pacific Coast population as “Threatened” on March 5, 1993. The designated breeding season begins on March 1 and ends on September 30 annually. Nest initiations can begin in late February, but typically the first nests are not initiated until mid to late March, and occasionally early April. The last nests are initiated by late-July, and hatch by mid-August, with the chicks fledging by mid-September. Snowy plovers are present year round at RGDP, with wintering populations ranging from 78-115 birds.

California least terns (*Sterna antillarum brownii*) utilize suitable breeding habitat from Baja California, Mexico to the San Francisco Bay area in California. Terns nest in colonies on open sand, sand-shell beaches, and sand-fill sites where little to no vegetation exists. Breeding colonies are typically located within close proximity to estuaries or waterways where birds forage for small fish. Least terns tolerate a considerable range in colony sizes. Some colonies have hundreds of birds, while some pairs nest alone or with only a few other pairs. The species was given both state and federal endangered status in 1970. In 1973, the population of the species neared 600 pairs, but had risen to an estimated 6437 to 6699 pairs in 2010 (Marschalek, 2010) and dropped to an estimated 4353-5561 pairs in 2013 (Frost, 2014). Least terns are typically present on RGDP from late May through August, and are absent the remainder of the year. During the 2015 nesting season no least tern nests were found and only 6-7 were seen hunting the estuary the week of 18-24 July.

Nesting snowy plovers (snowy plover, plover) and least terns (least tern, tern) were monitored on RGDP in 2001, and from 2003 through 2015. Monitoring did not occur in 2002. Prior to 2001 some non-intensive intermittent monitoring occurred, but no comparable data resulted from those efforts. This report compares data collected since 2001 when available and applicable (Applegate et. al. 2003, 2004, 2007, 2008, 2009, 2010, 2011, 2012, SRS 2006, Sandoval 2005, Persons 2001, Kelly 2013, 2014), with 2015 breeding season data. The RGDP boundaries were not surveyed and marked

until 2003, so some nests recorded in 2001 may not have been on RGDP property.

Study Area

Rancho Guadalupe Dunes Preserve (RGDP) is located in northern Santa Barbara County (County), California, and encompasses approximately 592 acres, including a portion of the Santa Maria River estuary, and beach and dunes immediately south of the Santa Maria River. The majority of the property within RGDP is suitable breeding habitat for snowy plovers and least terns. RGDP borders the Pacific Ocean for approximately 1.3 miles and extends inland up to 1.5 miles.

Strong westerly and northwesterly winds of 25 to 35 miles per hour are common in spring and early summer, but generally decrease as the season progresses. The breeding habitat is composed of windswept open sand beaches, fore-dune and back-dune zones, manmade gravel flats, sections of old asphalt road and oil pad, coastal dune scrub and a riparian corridor with seasonal mudflats. Beaches are littered with logs, small plant debris, kelp, rocks and shells of varying sizes, and minimal human litter. The fore-dune habitat is made up of open sand with low sparsely vegetated mounds and small dunes bordering the surf zone. Open sand expanses lead from the fore-dune area through the mid-dune and into the back-dunes. The mid-dunes are sparsely vegetated, and the back-dune area varies from open sand expanses to more densely vegetated dunes and scrub-covered areas.

Suitable plover and tern breeding habitat extends north of RGDP through the Guadalupe Restoration Project (a Chevron property formerly known as UNOCAL and as Guadalupe Oil Fields), Guadalupe-Nipomo Dunes National Wildlife Refuge, Oso Flaco State Park and Oceano Dunes State Vehicular Recreation Area. To the south, contiguous breeding habitat exists on Gordon Sand and Leroy Trust properties (Corralitos Ranch).

The habitat has changed slowly since our first monitoring season in 2003. The dominant native plant species are beach bur (*Ambrosia chamissonis*), sand verbena (*Abronia latifolia*, *A. maritima*), beach saltbush (*Atriplex leucophylla*), and beach morning glory (*Calystegia soldanella*). With the removal of invasive plant species more beach evening-primrose (*Camissoniopsis cheiranthifolia* subsp. *cheiranthifolia*), Dune Mint (*Monardella undulata* subsp. *crispa*), and Dunedelion (*Malacothrix incana*) are returning. Dominant non-native species are sea rocket (*Cakile maritima*), iceplant (*Carpobrotus edulis* and *C. chilensis*) in the foredunes, and perennial veldt grass (*Erharta calycina*), Bermudagrass (*Cynodon dactylon*), and narrow-leaved iceplant (*Conicosia pugioniformis*) in the backdunes. European beachgrass (*Ammophila arenaria*), a problematic invasive found on neighboring breeding sites, was present in a relatively small area in the foredunes just south of the parking lot; this was eradicated in the early years of the Preserve and so far remains absent. Ice plant removal has been slow but steady; foredunes south of the parking are 3/4ths cleared. In 2014 one snowy plover nest was found in the newly cleared area, and in 2015 three nests were found there. Ice plant removal efforts continue both north and south of the parking lot.

Methods

Snowy Plovers

Snowy plover monitoring was conducted in all suitable breeding habitat between March 1 and August 30, 2015. Melissa Kelly was the snowy plover monitor on site from March 1 through September 30. Thomas Applegate remained on call in case Least Terns arrived, but they did not. All surveys were conducted on foot. To avoid high afternoon winds, most surveys were completed in the morning. Later in the season when high winds became less frequent, some afternoon surveys were conducted.

An attempt was made to locate all snowy plover nests. The definition of a nest includes scrapes containing 1 or more eggs, or empty scrapes with convincing evidence that one or more eggs had been present. Empty scrapes without evidence of eggs or chicks, and single "dumped" eggs were not counted as nests. Nests were consecutively numbered and all pertinent information including attendant adults present, location, and number of eggs was recorded. Regular subsequent visits to each known nest were made, and the status of nests was recorded. Nests were not physically marked: their locations were recorded using a Global Positioning System (GPS) and existing landmarks.

Nest fates were determined by evidence at the nest sites. Those that disappeared before the expected hatch date were examined for the probable cause of loss. Empty nests near or past their expected hatch date were checked for chicks in the vicinity of the nest, displaying adults, eggshell pips in the nest, a flattened nest area, or for evidence of predators or other causes of loss. Hatching dates were estimated by known or estimated egg laying dates, and were projected 28 days after clutch initiation (Warriner et.al., 1986). Eggs were not floated and chicks were not banded.

Since reports concerning adult plover deaths in exclosures, thought to be the result of predator harassment, exclosures were not used in 2014 or 2015 and no adult deaths occurred. In both 2012 and 2013 adult plover deaths occurred, one with the body found in the exclosure, and the other with the body found directly beside the exclosure. Mini-nest exclosures consisted of a 36 inch cube made of no-climb wire fencing, open on the bottom and secured over the nests with 4 foot T-posts or fiberglass rods. Larger exclosures are not practical with only one monitor and 592 acres to cover, however every effort is made to maintain maximum distance from nests when monitoring, observing eggs and parents from a distance with binoculars so minimal intrusion, scent, and tracks are left near the site.

Three coordinated census surveys are conducted each year; a Winter Survey, a Breeding Survey, and a Nesting Survey. The Winter and Breeding Surveys are conducted each Jan and May as part of coordinated range-wide efforts to estimate plover populations; range-wide is currently from southern Washington to Baja. Both these yearly censuses are coordinated by USFWS, State Parks, and Point Blue Conservation Science. The Winter Survey is scheduled to enumerate fairly stable winter roosting populations at all current and historic wintering sites. Plover numbers, gender, location, and bands are recorded. The Breeding Survey is scheduled to occur during the period when the population is expected to be stable and consist primarily of breeding plovers. During this census, plover age, gender, location, and the number and size of accompanying chicks are recorded. Each plover is checked for color-bands. In the Nesting Survey numbers of nesting plovers are estimated bi-weekly at each breeding site from active nest data.

California Least Terns

Least terns were anticipated and sought after expectantly but none were seen nor heard until 6-7 birds, adults and young, began hunting the estuary the week of 20-25 July.

Results

Snowy Plovers

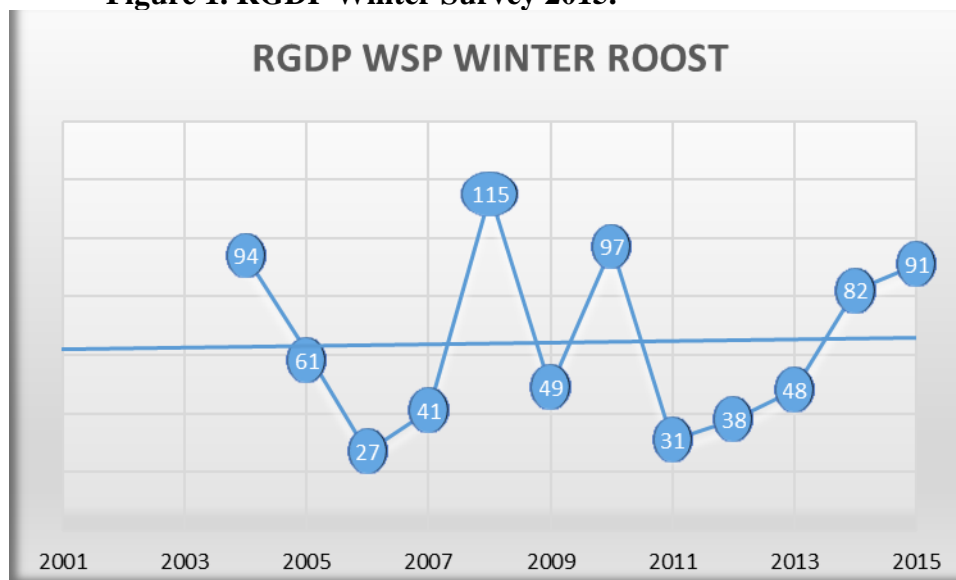
Population

The Winter and Breeding Surveys are conducted each January and May. Prior to 2012 Winter Surveys were conducted by staff from Oceano Dunes State Vehicle Recreation Area (ODSVRA); from 2012-2015 surveys have been conducted by me, the RGDP Naturalist/Monitor (Table 1 and Figure 1).

Table 1. Winter Surveys Jan 2004-2015 WSP Count.

		2004	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15
Rancho Guadalupe Dunes Co. Park	County	94	61	27	41	115	49	97	31	38	48	82	91
Mussel Rock Beach	Private		0	8	16	4	34	3	29	0	30	73	19
Paradise Beach	County			NS	0	0	0	0		0	0	0	0
# banded birds seen										7			14

Figure 1. RGDP Winter Survey 2015.



The 2015 Winter Survey at RGDP was conducted Sunday 17 January with the help of Russell Walker, a local hiker/birder who makes the trip to Pt. Sal each Friday and Sunday. The beach and foredunes were surveyed as we walked in tandem from the Santa Maria River Estuary to the south end of Paradise Beach at Pt Sal. At the river estuary there were two pair; in front of the parking lot was a pair; 200 feet south of the parking lot were 84 plovers roosting in a group in the foredunes; 16 of the 84 were males; 68 were of undetermined gender. Five hundred feet south of the parking lot

was a solitary snowy plover. At Mussel Rock Beach were a total of 19 plovers (Table 2).

Table 2. Winter Survey 2015 - WSP's by Gender.

	Males	Females		Gender Undetermined
RGDP	19	3		69
Mussel Bch				19
Paradise Bch	0	0		0
TOTAL	19	3		88

TOTAL = 110 snowy plovers; 19 were males in breeding plumage. Fourteen of the 109 were banded (Table 3).

Table 3. Winter Survey 2015 – WSP's Banded.

AN:??	U
AR:BW	M
AY:GY	U
BB:GG	M
BB:GR	U

BB:RY	U
GA:VB	M
GG:BR	U
GG:VR	U
GG:YG	U

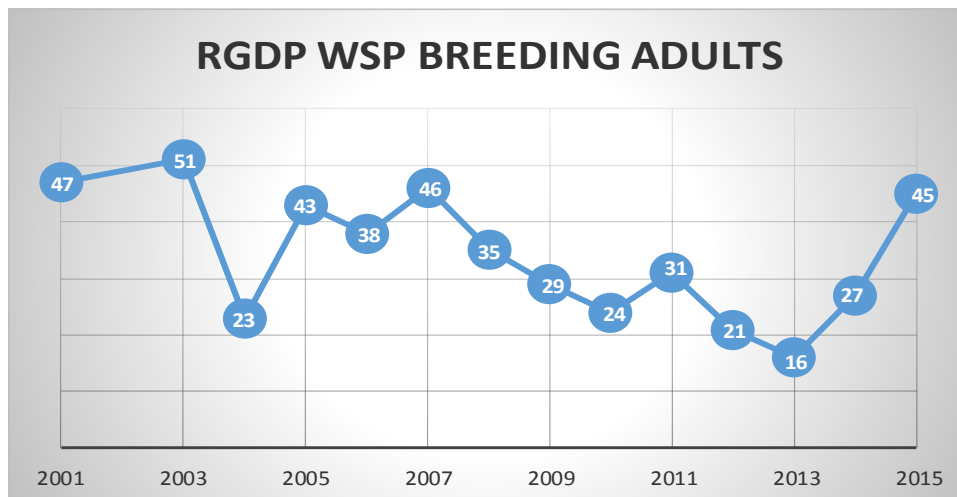
GY:??	U
RR:GG	M
RR:PY	M
RR:WG	M

The Breeding Survey has been performed at RGDP each year from 2001-2015, excluding 2002 (Table 4). The number of plovers observed on the census is not considered the total number using RGDP at the time because plovers are not easily detected due to expansive topography, and plovers may leave the site temporarily and often during the survey.

Table 4. Breeding Surveys 2001-2015 – WSP counts.

		2001	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15
Rancho Guadalupe Dunes Co. Park	County	47	51	23	43	38	46	35	30	24	31	21	12	27	45
Mussel Rock Beach	Private				6	13	10	17	11	14	1	6	4	6	19
Paradise Beach	County				9	12	12	0			4	0	0	0	2
# Banded birds seen															9

Figure 2. Breeding Surveys 2001 - 2015.*



*No snowy plover monitoring was conducted in 2002.

The

2015
Breeding

survey was conducted on Sunday 17 May by Melissa Kelly; again with the help of Russell Walker who walked the beach as I walked inland through the foredunes (Figure 2. And Table 5).

Table 5. Breeding Survey 2015.

	Males	Females	Undetermined	Chicks
RGDP	23	11	11	0
Mussel Rock Beach	16	6	0	2
Paradise Beach	0	2	0	2
Total	61	19	11	2

All plovers were checked for color bands. Nine banded adults seen were (Table 6).

Table 6. Breeding Survey Banded Snowy Plovers 2015

AG:OY	M
AG:WG	M
BB:GR	M

BY:RR	M
GG:PV	U
GG:WG	F

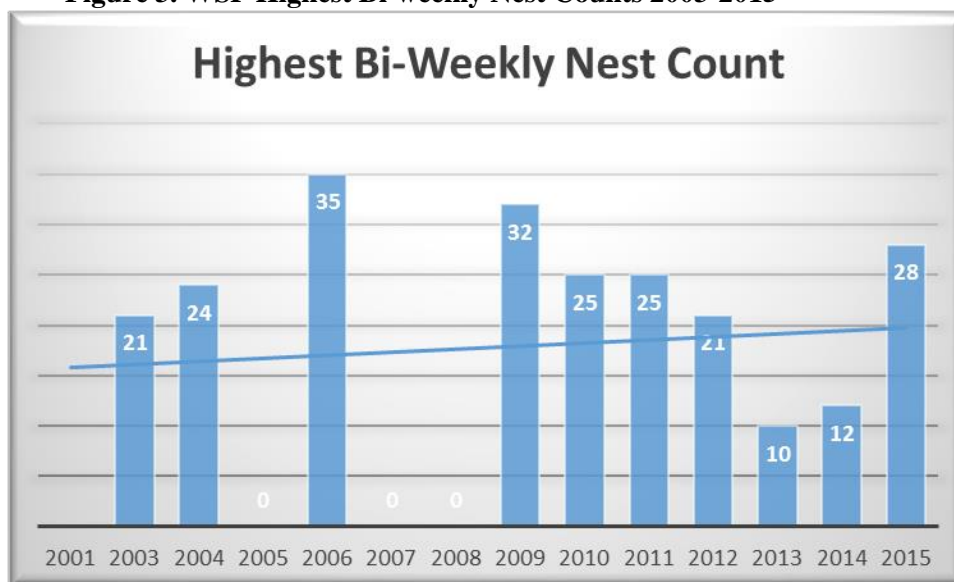
PG:AW	M
V:GWG	M
VB:AY	M

The numbers of nesting plovers is estimated bi-weekly from active nest data. A peak number of 28 nesting pairs were present in early May (Table 7). The estimate includes only nesting plovers and not breeding plovers actively rearing broods or in the process of nest initiation. An accurate number of brood rearing plovers is not possible in such a large area without chick banding, as it is, for example, at Coal Oil Point Reserve. Figure 7 shows highest bi-weekly nest counts since 2003.

Table 7. Bi-weekly nesting pairs -- 2015 breeding season.

March		April		May		June		July		August	
Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
0	3	8	19	28	19	10	4	14	6	3	0

Figure 3. WSP Highest Bi-weekly Nest Counts 2003-2015*

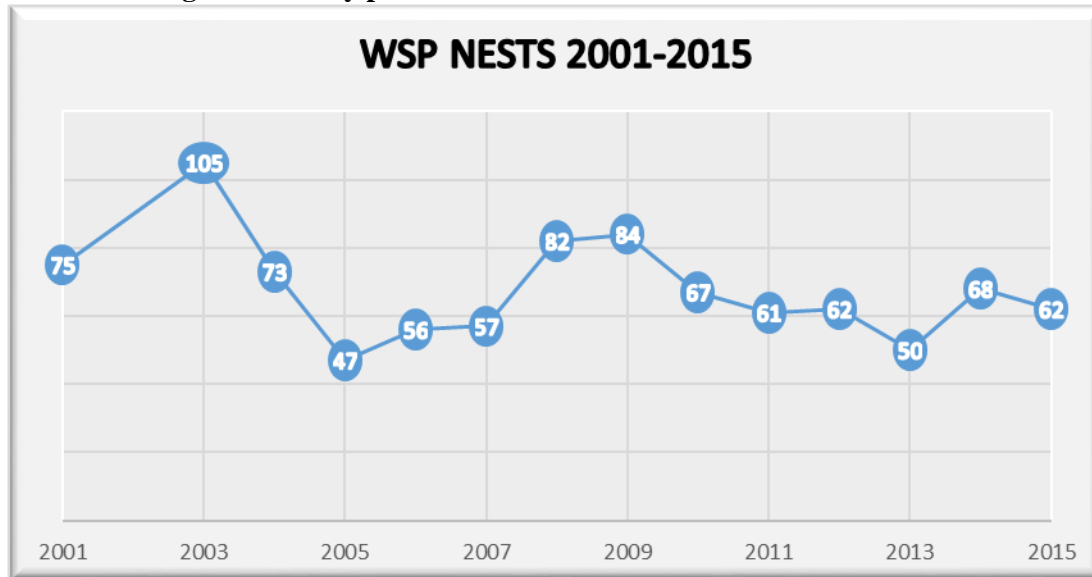


*No data available for 2005, 2007, 2008.

Nesting and Productivity

Sixty-two snowy plover nests were located on RGDP during the 2015 breeding season (see also Appendix 1. 2015 Snowy plover nest locations at RGDP). The actual number of nests was likely higher. It is probable that some nests were never found in this large area, other nests were preyed on before they could be documented or were documented as predator unknown. The number of nests and their fates from 2001 through 2015 are compared in Figure 4 and Table 8.

Figure 4. Snowy plover nests on RGDP from 2001 - 2015.*



* No snowy plover monitoring was conducted in 2002.

The fates of 60 of the 62 nests were determined. Thirty-one nests hatched at least 1 chick, 26 were lost to predators, 2 were abandoned, 1 nest was buried by blowing sand (wind), 0 were lost to surf wash, and the fate of 2 nests was unknown since the wind or rain destroyed any evidence of whether they hatched, had been predated or were destroyed by some other means.

Table 8. Number and percent of snowy plover nests and their fates from 2001 through 2015.*

Year	Hatch	Dest. Pred.	Dest. Unk.	Unk. Fate	Aband.	Dest. Surf	Dest. Wind	Dest. Cattle	Dest. River	Dest. Human	Total Nests
2001	25 (33%)	18 (24%)	25 (33%)	1 (1%)	4 (5%)	0	2 (3%)	0	0	0	75
2003	14 (13%)	64 (61%)	10 (9%)	5 (5%)	5 (5%)	0	5 (5%)	2 (2%)	0	0	105
2004	23 (32%)	36 (49%)	2 (3%)	3 (4%)	4 (5%)	0	1 (1%)	0	4 (5%)	0	73
2005	27 (57%)	8 (17%)	0	2 (4%)	10 (21%)	0	0	0	0	0	47
2006	32 (57%)	16 (29%)	0	2 (3%)	5 (9%)	0	0	0	0	1 (2%)	56
2007	27 (47%)	22 (39%)	1 (2%)	4 (7%)	3 (5%)	0	0	0	0	0	57
2008	33 (40%)	26 (32%)	11 (14%)	6 (7%)	5 (6%)	0	1 (1%)	0	0	0	82
2009	39 (46%)	27 (32%)	5 (6%)	5 (6%)	8 (10%)	0	0	0	0	0	84
2010	34 (51%)	24 (36%)	4 (6%)	1 (1%)	3 (5%)	0	0	0	0	1 (1%)	67
2011	29 (47%)	20 (33%)	1 (2%)	1 (2%)	10 (16%)	0	0	0	0	0	61
2012	20 (32%)	27 (43%)	2 (3%)	1 (2%)	11 (18%)	1 (2%)	0	0	0		62
2013	21 (42%)	11 (22%)	0	10 (20%)	8 (16%)	0	0	0	0	0	50
2014	31 (46%)	23 (34%)	0	5 (7%)	6 (9%)	0	3 (4%)	0	0	0	68
2015	31 (50%)	26 (42%)	0	2 (3%)	2 (3%)	0	1 (2%)	0	0	0	62

Fate Codes

Hatch - hatched one or more eggs, Dest. Pred. - destroyed by predator, Dest.Unk. - destroyed, cause undetermined, Unk. Fate - unknown, disappeared without evidence of hatch or loss, Dest. Surf - destroyed by surf wash, Aband. - abandoned before hatch, Dest. Wind - destroyed by wind, Dest. Cattle - destroyed by cattle, Dest. Flooding - destroyed by river flooding, Dest. Human - destroyed by human activity.

* No snowy plover monitoring was conducted in 2002.

A total of 949 nests have been documented on RGDP over the past 13 (no monitoring 2002) monitored breeding seasons (Table 9). Of these, 386 have hatched at least 1 chick, resulting in an overall hatch rate of 40%. The depredation rate for this period was 36%; 7% percent destroyed by unknown causes, 8% abandoned, 1.3% lost to wind, 0.2% lost to river flooding, 0.3% destroyed by cattle, 0.3% destroyed by human activities and 0.1% destroyed by surf wash. Fates of 4% of the total nests were undetermined.

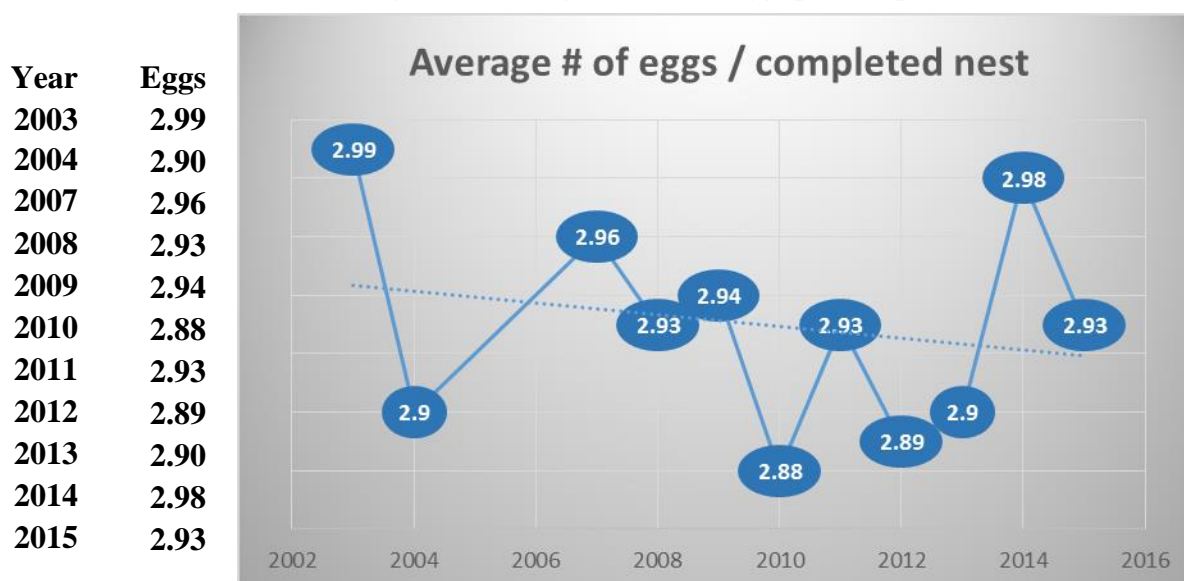
Table 9. Combined number of snowy plover nests and their fates from 2001 - 2015.*

Years	Hatch	Dest. Pred.	Dest. Unk.	Aband	Dest. Wind	Dest. River	Dest. Cattle	Dest. Human	Dest. Surf	Unk. Fate	Total Nests
2001-2015	386	346	61	76	13	4	2	2	1	42	949
%	40.7%	36.5%	6.4%	8.0%	1.4%	0.4%	0.2%	0.2%	0.1%	4.4%	--

* No snowy plover monitoring was conducted in 2002.

Forty-four of the 62 nests were complete. Of the 44 completed nests, 3 held 2 eggs and 41 held 3 eggs, **for a total of 129 eggs**. This results in a mean clutch size of 2.98 eggs per clutch. The mean clutch size for each year (data is not available for 2001, 2005, and 2006) is as follows:

Figure 5. Average number of eggs per completed nest.



From the 18 nests not completed, there were **25 eggs**:

2-Egg Nests	1-Egg Nests
1 nest buried by the wind = 2 eggs	10 nests predated = 10 eggs
5 nests predated = 10 eggs	1 nest abandoned = 1 egg
1 nest was abandoned = 2 eggs	

This brought the total number of known eggs produced on RGDP in 2014 to **129 + 25 = 154**. An unknown number of nests were probably predated by ravens or an unknown predator before eggs were found, but wind or rain erased any evidence of predation.

Estimated or actual initiation dates were determined for all 62 nests. The estimated number of nest initiations monthly is compiled in Table 9 and compared with years this data was available.

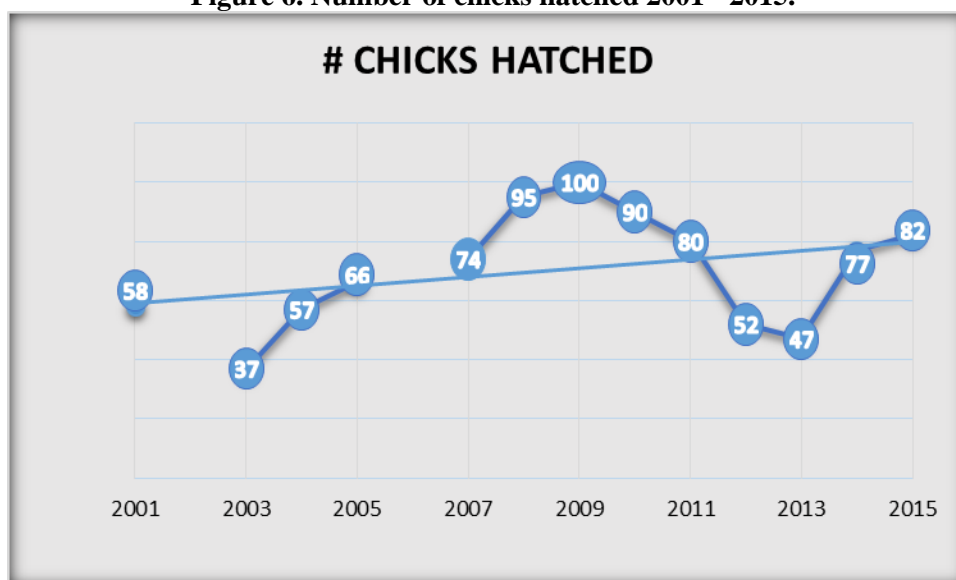
Table 10. Nest initiations by month in 2003 - 2015.*

Month	Number of Nests										
	2003	2004	2007	2008	2009	2010	2011	2012	2013	2014	2015
March	7	0	0	4	4	1	3	0	0	3	3
April	15	20	17	11	24	10	22	20	7	23	26
May	23	21	18	23	15	23	14	13	13	15	16
June	33	21	13	19	31	23	15	20	23	19	14
July	11	6	8	22	10	10	7	9	7	7	3
Aug	0	0	0	0	0	0	0	0	0	1	0
Total	89	68	56	79	84	67	61	62	50	68	62

* Data not available for 2001, 2002, 2005, and 2006. Nests with estimated or known initiation dates only.

At least 82 chicks hatched from the 31 successful nests. Twenty-three of the nests hatched 3 chicks, 5 nests hatched 2 chicks, and 3 nests hatched 1 chick. The number of chicks hatched from 2001 through 2015 - excluding 2006 - is compiled in Figure 6.

Figure 6. Number of chicks hatched 2001 - 2015.*



*Data not available for 2002, or reported in 2006. ** At least 100 and possibly as high as 104 chicks hatched in 2009.

Brood Movement and Fledging

Because of the large size of the Preserve and the caution of the parents, broods are difficult to track. A few broods were in evidence however. In addition to chicks seen at the nest while hatching, post-hatching broods or evidence of broods with a parent were observed on **61** occasions during the breeding season; this does not include fledglings. Broods were observed, near the beach north and south of the parking lot, in the mid-dunes south of the parking lot, north at the estuary, in the back dunes near the Gordon Sand Pit, and south of the Preserve boundary closer to Mussel Rock. It is likely the ravens preying on nests were also preying on chicks; during the time of intense raven predation the dunes were very quiet with very little evidence of parents or chicks. In addition to ravens; northern harrier, coyotes, raccoons, possums, skunks, red-tailed hawks, great horned owls and gulls were present and may have accounted for some chick loss.

The earliest expected 2015 fledge date was approximately **26 May** and the last was expected to occur about **10 September**. The earliest seen fledgling was seen on **Jun 3rd**, with three additional fledglings seen in June, and 19 seen in July. Numerous fledglings were seen in August and September.

Predators

Predators destroyed at least 26 (41.9%) of the 62 nests of known fate this season (Table 5). Common raven (*Corvus corax*) was the predominant observed and documented predator species. Ravens destroyed 12 nests (19.4%). Fourteen nests were lost to unknown predators (22.6%). Of the fourteen nests lost to unknown predators, evidence was obscured by rain and/or wind at six locations, and evidence was insufficient or nonexistent at the other eight. Northern harriers were seen hunting four times during surveys among the foredunes south of the parking lot. The first ravens and raven predations were seen on May 15th. Rain occurred during early morning of the 15th so evidence of predation was absent, but 4 nests were definitely predated and two nests due to hatch were fate unknown. Two ravens were seen at 6pm flying over the parking lot. Over the next two weeks 16 of 28 nests were predated, 12 by ravens, 3 by unknown predators, and one nest due to hatch but noted as fate unknown due to rain and wind. On Sunday June 1st Barry Lowry of Wildlife Services, whose services were generously loaned by Oceano Dunes State Vehicle Recreation Area, was able to shoot one of a pair of ravens flying over the dunes northeast of the parking lot. Raven tracks were seen in the nesting area on:

13 June - 3 areas of numerous raven tracks, one chasing rodents in circles;
17 June - 1 area of raven tracks at an otter carcass;
19 June - again chasing rodents in circles.

No raven tracks were found after June 19th. Ravens have also been problematic in 2003, 2004, 2007, 2011, 2012, 2013, and 2014.

Between June 2nd and July 9th four nests were taken by unknown predators. Perhaps coincidentally, Northern Harriers were observed four times hunting in the foredunes during surveys.

Coyote tracks were observed throughout breeding habitat on all surveys, and individuals were

observed on a number of occasions. Track evidence showed that coyotes traveled the shoreline, back-dunes and river flats regularly. Their paths/tracks are sometimes found walking past nests but no tracks were found at predated nests.

Additional potential predators observed visually or by tracks this season were American kestrel (*Falco sparverius*), California gull (*Larus californicus*), Cooper's hawk (*Accipiter cooperii*), Great blue heron (*Ardea herodias*), Heermann's gull (*Larus heermanni*), Merlin (*Falco columbarius*), Northern harrier (*Circus cyaneus*), Virginia Opossum (*Didelphis virginiana*), peregrine falcon (*Falco peregrines*), raccoon (*Procyon lotor*), red-tailed hawk (*Buteo jamaicensis*), ring-billed gull (*Larus delawarensis*), striped skunk (*Mephitis mephitis*), and western gull (*Larus occidentalis*).

Table 11. Number of plover nests lost to predators on RGDP, 2001 - 2015.*

Species	Number Nests Lost													
	2001	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Raven	0	16	20	0	0	6	0	0	1	11	19	8	7	12
Coyote	0	14	7	4	10	10	8	7	6	0	1	1	1	0
Gull	0	4	0	2	1	1	4	1	0	0	0	0	0	0
Crow	4	2	0	0	0	1	0	2	0	0	0	0	0	0
Unidentified Corvid**	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Northern Harrier	0	0	0	0	0	0	0	0	1	0	0	0	?	?
Great Horned Owl	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Unk. Avian Predator	0	0	0	0	0	0	0	9	4	6	3	0	1	0
Unidentified Species	14	28	9	2	5	5	14	8	10	2	4	2	12	14
Total lost to Predators	18	64	36	8	16	22	26	27	24	20	27	11	23	26
% of total nests lost to predators	24%	64%	51%	17%	30%	42%	34%	34%	36%	33%	44%	27%	36%	43%
Total number of nests*	74	100	70	47	54	53	76	79	66	60	61	40	63	60

* Known-fate nests only. ** Raven or crow.

Least Terns

Since 2001, least terns have nested on RGDP 7 of the 15 breeding seasons. Nesting has occurred in the same general location: approximately 2500 to 3500 feet south of the parking area, and approximately 300 to 800 feet east of the shoreline. Monitoring did not occur in 2002, but Applegate

visited the site and observed multiple nesting least terns and chicks in that area. In 2003, Applegate observed a roosting tern and a scrape in the area but no nest was known to be initiated. Terns did not nest on RGDP in 2003, 2006, 2008, 2011, 2012, 2013, 2014, nor was there nesting in 2015.

Table 12. Least tern nests and their fates from 2001 through 2015.*

Year	Total Nests	Hatch	Dest. Predator	Predator	Pred Unk.	Dest. Unk.	Aband.	Unk. Fate
2001	12	8 (67%)	2 (17%)	coyote		1 (8%)	0	1 (8%)
2002	multiple	multiple	unk	unk	unk	unk	unk	unk
2003	0	0	0	0	0	0	0	0
2004	8	3 (37.5%)	1 (12.5%)	0	1	3 (37.5%)	1 (12.5%)	0
2005	4	0	1 (25%)	coyote	0	0	0	3 (75%)
2006	0	0	0	0	0	0	0	0
2007	1	1 (100%)	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0
2009	3	2 (67%)	1 (33%)		1	0	0	0
2010	1	1 (100%)	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2013	1 prob attempt	0	1 prob	Raven prob	0	0	unk	unk
2014	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0

Fate Codes

Hatch - hatched one or more eggs, Dest. Predator - destroyed by predator, Dest.Unk. - destroyed, cause undetermined,

Aband. - abandoned before hatch, Unk. Fate - unknown, disappeared without evidence of hatch or loss

* No least tern monitoring was conducted in 2002.

Table 13. Number of least tern nests, chicks, and fledglings in the 2001 through 2015 breeding seasons.*

Year	Number of Nests	Number of Chicks	Number Fledged	Numbers Observed Onsite	Estuary Breakouts
2001	12	14	6-8		Data not available
2002	multiple	multiple	unk	multiple	Data not available
2003	0 nest, 1 scrape	0	0	1	Data not available
2004	8	7	unk		Data not available
2005	4	0	0		Data not available
2006	0	0	0		Data not available
2007	1	1	1		Data not available
2008	0	0	0		Data not available
2009	3	3	3		Data not available
2010	1	2	1		Data not available
2011	0	0	0	3 fly S June 5 & June 13; single tern date unk	Data not available
2012	0	0	0	2 adults flying North	Open 9 times throughout the year
2013	Unk nest, 7 scrapes	0	0	Up to 20 at estuary regularly late May-late July	Three: 6Mar, 4Jun, 20Sep
2014	0	0	0	0: none were seen or heard all season.	One: big storm 28Feb
2015	0	0	0	6-7 ad & chx hunting estuary and ocean south: 22Jul, 23Jul, 26Jul	Three: 1Jan, 9Jan, 13Jan
TOTAL	29				

The number and timing of annual estuary breakouts are likely to affect conditions suitable for

fish species presence and abundance, and therefore Least Tern nesting at RGDP. Variables to consider would include dissolved oxygen concentration, algal populations, contaminants, salinity, abundance of fish predators, disturbances affecting prey and predator abundance (fishing, swimming, canoeing, cattle, hunting to name a few).

In 2009, when 3 least terns nested, terns were observed foraging and catching small fish immediately west of the colony on two occasions. This is approximately 3500-4000 ft south of the estuary mouth. They were also seen returning with fish from south of RGDP.

In 2012 the estuary broke open 9 times; least terns were observed feeding in the estuary but did not nest. With the onset of drought the river mouth remained closed most of the 2013 breeding season, breaking open 3 times: 6 March, 4 June, and 20 September. This may have increased the density of prey fish for the terns, accounting for their presence and continued activity through the summer of 2013. The river mouth broke only once in 2014 on 28 February but perhaps concentrations of agricultural runoff had become too high to support an adequate food supply. A collaborative study on water quality on the Central Coast in 2010 maintained that

“The Santa Maria River estuary was the most impacted water body in this study” and that “the majority of water samples were highly toxic to invertebrates.” ... “Impacts in the Santa Maria River estuary were likely due to the proximity of this system to Orcutt Creek, the tributary which accounts for most of the flow to the lower Santa Maria River. Water and sediment samples from Orcutt Creek were highly toxic to invertebrates and toxicity was due to mixtures of the same pesticides measured in the estuary. Sand crabs and fish collected in and adjacent to the Santa Maria estuary were contaminated with numerous fungicides, herbicides, and pesticides.”... “Sand crabs from the surf zone adjacent to the Santa Maria estuary mouth continue to be contaminated with high concentrations of DDT.”... “Thirteen current-use pesticides as well as DDT and its two primary degradation products were detected in fish collected from the Santa Maria River estuary. The organophosphate pesticides chlorpyrifos and diazinon were detected in all fish from this estuary, as was the pyrethroid pesticide, bifenthrin. As was observed in sand crabs, several fungicides were also detected in fish tissue”.

In 2015 the estuary broke out briefly three times: Jan 1, Jan 9, and Jan 13. Least Terns did not nest and were seen only three times in late July; mixed adults with young hunting the estuary and flying south to fish in the ocean.

Human Activities Affecting Plovers and Terns

Vehicle access to the beach parking lot at RGDP was open seven days a week all year except for one full day and 17 partial days (78 hrs, or the equivalent of 9.75 days) when the Park was closed to clear sand from the road.

Visitor access and habitat closures remained the same as in previous years. During the nesting season visitors were restricted to the 2-mile long access road, parking area, and the beach west of a symbolic fence line (see RGDP Map Appendix A). The symbolic fence consisted of a single strand of yellow nylon rope stretched between 6' metal t-posts 15-20' apart. Habitat closure signs were mounted on approximately every fifth post. Signs, written in English and Spanish, alerted visitors not to enter the

nesting habitat. The fence ran a short distance above the mean high tide line along the beach from the estuary spit ~1000' north of the parking lot to the south boundary, and was moved east or west throughout the breeding season as needed where beach sand accreted and eroded. The fence also lined both sides of the access road, the south boundary of RGDP, and all but the west side of the beach parking lot. The signs and rope remained in place from March 1st through September 27th.

County staff maintained a presence on RGDP during open hours throughout the breeding season. One of their tasks was to ensure Park visitors were aware of restrictions and prevent them from entering closed breeding habitat. Even with staff presence, 38 incidents of trespass occurred, 17 of these were at the south end of the sandspit which borders the west side of the estuary. In 2014 21 of the total 26 trespass incidents occurred on the south end of the estuary sand spit. Trespassing south of the parking lot also occurs regularly. Trespass along the access road occurs less often but is also harder to detect since most time is spent in the parking lot where the most intensively used nesting areas are visible.

There were no known incidents of human-caused loss of nests, chicks or adult plovers on RGDP in 2015, although on trespass south of the parking lot came within two feet of a 3-egg nest a few days before its' projected hatch date.

Discussion

The 2015 distribution of nesting and flocking snowy plovers on RGDP was largely consistent with previous years. Fifty-six of the 68 nests (82%) were located within a 550 foot zone from the mid-dunes to the high tide line. Two nests were initiated near or directly beside the access road, and the remainder were scattered in the back-dunes. Fourteen of the nests were from 770 to 2200 feet from the high tide line. No nests were found at the northeast section of the Park (the site of the 1923 Ten Commandments movie set and a Chumash Indian midden site) as they have in previous years. This is a high point within the Park and ravens are frequently seen in this area. Seasonal sand flats along the Santa Maria River have revegetated somewhat; very little snowy plover activity and no nests were initiated in the river flats in 2015.

The 2015 nest total decreased by six nests compared to the 2014 sixty-eight nest total, but the number of breeding pairs appeared to have more than doubled from 12 in 2014 to 28 in 2015. Efforts to remove ice plant from foredune nest habitat may have been a factor in the increase, however timing in the nesting and persistence of ravens and other predators will also play an important role. The number of chicks hatched was up slightly from 77 in 2014 to 82 in 2015. A number of newly hatched chicks undoubtedly fell prey to a pair of ravens that were very active in the park from 13 May to 1 June. Nest exclosures were not used in 2015, and the total nest count was likely higher than was documented.

Despite heavier predation in 2015 (36% in 2014 increased to 43% in 2015), a higher percentage of predated nests (43%) and 6 fewer nests, snowy plover productivity in 2015 improved slightly from 77 chicks in 2014 to 82 chicks hatched in 2015. Some chicks were seen after hatching and some older chicks were observed during the breeding season, but predation of chicks is likely, and difficult to monitor or quantify in such a large space. Predators remain the leading cause of nest loss on RGDP. In 2005 Sandoval reported that nest abandonments (n=10) were higher than depredations (n=8), but in all other seasons predators by far have been the leading cause of nest loss. Over the last

14 monitored seasons, the mean percent lost to predators is 37%. Ravens, always efficient at finding nests, undoubtedly found and destroyed some nests before they could be documented. An unknown predator, possibly Northern Harrier, was also efficient. Despite having a depredation permit in 2015 Wildlife Services was not contracted, although grant funding could readily be obtained for this purpose. Without the help from ODSVRA predation would have undoubtedly been much higher.

Gulls have not been observed predating chicks or nests; northern harriers are seen most of the time hunting in the river hunt but were seen four times hunting the foredunes south of the parking lot; no evidence of coyote or great horned owl predation was found in 2015.

Mini nest exclosures were not used in 2014 or 2015. While exclosures are effective in reducing predation, other issues such as adult plover mortality (Persons et al. 2003) and nest abandonments (Hardy and Colwell, 2008) have been attributed to their use. In addition, coyotes are sometimes attracted to exclosures and either pull them up or undermine them as on RGDP in 2010 and 2012 (Applegate Pers. Obs). Only two nest abandonments occurred in 2015; down substantially from most years.

The plover and tern breeding habitat on RGDP is generally of high quality, but encroachment of ice plant threatens to degrade habitat. Spreading ice plant facilitates the unnatural growth of high dunes south of the parking lot, and large areas of iceplant are found on the north and south sides of the road just east of the beach parking lot. Park staff began removing ice plant, black mustard, and other invasive plants by hand in 2011. Removal of these species from the Park should be considered a management priority. European beach grass has been eliminated on RGDP, but the site should be monitored closely for its reintroduction. If this species is found, immediate action should be taken to remove it. Veldt grass and narrow leaf ice plant are invasive in scrub habitat on RGDP, but do not appear to be causing any loss of breeding habitat at this time. These species should be monitored on a yearly basis and action should be taken if they begin to spread. Pampas grass was discovered on RGDP in 2011 and was removed by Park staff. Continued use of the mini exclosure, though less desirable than a larger exclosure, remains the best alternative for especially vulnerable nests because of their lighter weight and the distances involved at RGDP.

Management Recommendations

Monitoring conducted since 2001 has shown that RGDP is an important breeding site for snowy plovers and has unrealized potential for least terns. Monitoring efforts have identified trends, important nesting areas, and a range of predators and other factors affecting nesting and fledging success. These data should be used to implement management plans that will protect and enhance least tern and snowy plover populations, while allowing continuing passive recreational use by the public.

RGDP provides important nesting habitat for snowy plovers and least terns, and also has the ability to direct management goals toward habitat improvements that may increase overall western snowy plover and California least tern populations. It has benefited from relatively light use in the past but the growing population on California's Central Coast is having an impact. A minimum of 34,846 vehicles, up 3600 from 2013, and 67,728 people in 2014, up 6850 from 2013 visited the Preserve in

2014. To increase productivity and reduce disturbance to plovers and terns on RGDP, we present the following recommendations:

1. Visitor use - To protect nesting plovers and terns, continue to install Sensitive Area signs and symbolic fence from March 1 through September 30 each year. Added measures to discourage trespass into protected areas should include continued park staff presence at the beach during all hours that RGDP is open to the public, with the staff's priority on preventing trespass, educating visitors; prevention of collection of natural objects and damage to dune vegetation. Appropriate signage prohibiting collection of natural materials would be beneficial. Interpretive signage on the sensitivity of dune wildlife would also help to make the public aware that the dunes are more than the vast expanse of sterile sand they might appear to be to the casual observer.

2. Trespass – Trespass into breeding habitat continues to put plovers and terns in danger. We recommend that the County continue using its citation authority to ticket visitors who knowingly enter breeding habitat. If the public knows citations will be issued, they will be less likely to enter the closed habitat.

3. Predators - Although some nest loss to predators is to be expected during any breeding season, predators can have a catastrophic influence on breeding success. Predator management strategies, including the use of mini nest exclosures or larger exclosures when needed, should be developed to reduce the incidence of excessive predation on the RGDP. Annual application by the County for a Federal depredation permit and contracting with Federal Wildlife Services for discreet dispatch of the most severe predators would benefit all of the wildlife management entities on the Central Coast.

Park staff should continue to practice good predator management activities such as daily removal of garbage and litter from the beach area and parking lot, cleaning trashcans to prevent nesting mice, keeping storage areas closed and sealed to prevent mice infestations, and enforcing regulations prohibiting the feeding of wildlife. Additionally, staff help identifying potential predators and recording times and locations observed would provide valuable information for the monitor that could be incorporated into the annual Recovery Report.

4. Least terns - We recommend that when least terns nest on RGDP that they receive priority protection given their sensitive nature and endangered status. A long-term plan to increase least tern nesting on the site would be valuable. The plan should include: 1) tracking observations of least terns and their hunting areas each year by onsite staff, 2) diligence in protecting the colony from human disturbance, 4) protecting and improving habitat by a regular year-round schedule of invasive plant removal, 5) providing for long-term monitoring and predator control.

5. Habitat enhancement - Exotic invasive plant species are an ongoing problem at RGDP. Invasive plants reduce and degrade breeding habitat: iceplant, sea rocket and veldt grass threaten to overtake more suitable plover and tern nesting habitat each year. Park staff with the help of numerous volunteers recruited by the Dunes Center filled 752 30-gallon trash bags with ice plant and sea rocket from the fore dunes, and veldt grass from the roadsides. We recommend encouragement of more volunteers to help with invasive removal and a continued aggressive eradication program to eventually completely remove invasive species.

6. Monitoring - We recommend that RGDP continue to support ongoing quality monitoring that addresses population, nesting, predation, depredation, and hatching and fledging success, along with

other issues such as impacts of public use that may affect snowy plover and least tern productivity. Successful management of the site will depend on the use of this information as a basis for sound short and long term management practices.

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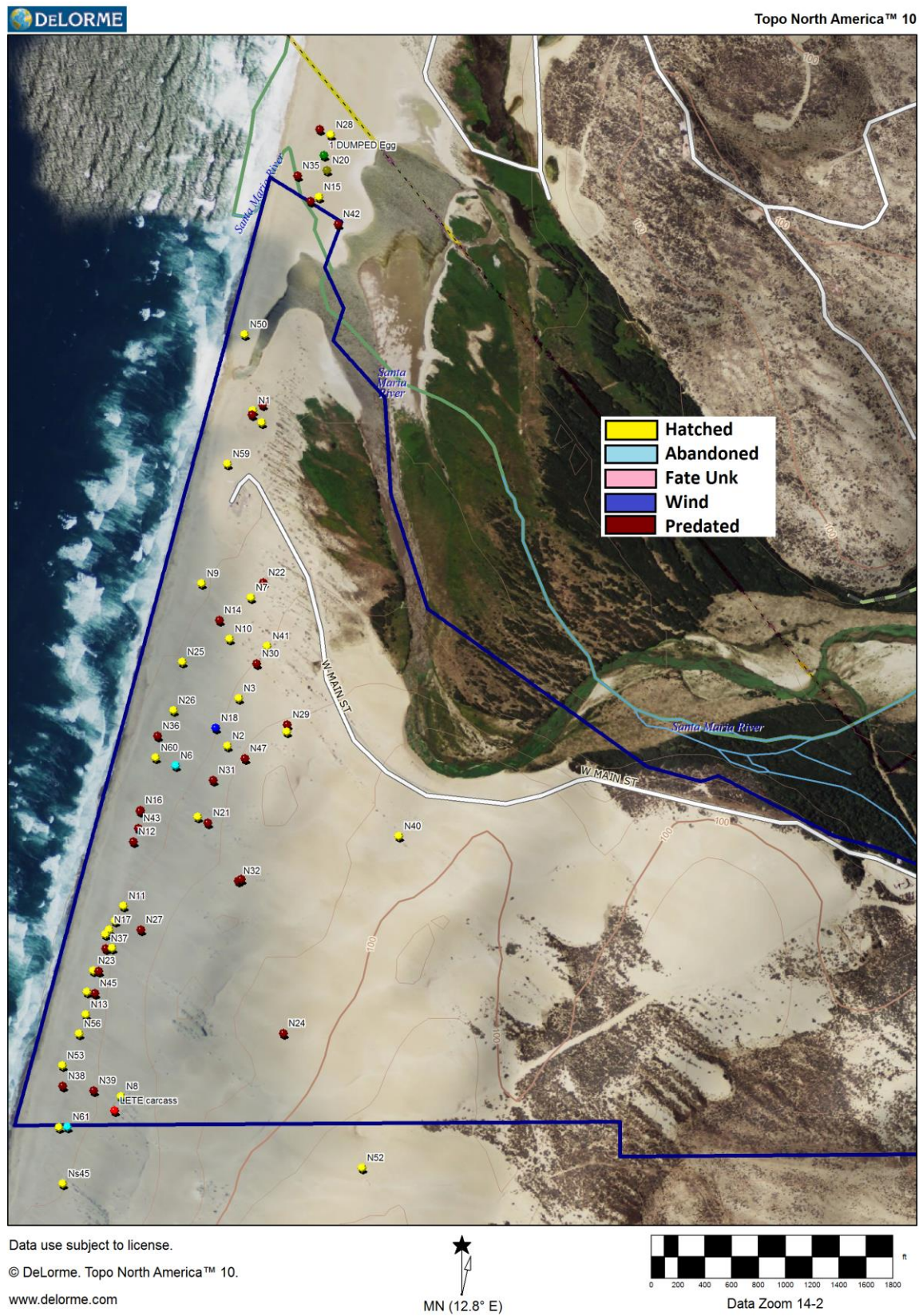
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Appendix 1. RGDP Map showing 2015 Snowy plover nest locations.



Appendix 2. Other species or their sign observed on RGDP during 2014

American pipit (<i>Anthus rubescens</i>)	Least sandpiper (<i>Calidris minutilla</i>)
American yellow warbler (<i>Setophaga petechial</i>) formerly <i>Dendroica petechia</i>	Long-billed curlew (<i>Numenius americanus</i>)
Barn swallow (<i>Hirundo rustica</i>)	Long-tailed weasel (<i>Mustela frenata</i>)
Black-bellied plover (<i>Pluvialis squatarola</i>)	Mallard (<i>Anas platyrhynchos</i>)
Black-crowned Night Heron	Marbled godwit (<i>Limosa fedoa</i>)
Black phoebe (<i>Sayornis nigricans</i>)	Mountain lion (<i>Felis concolor</i>)
Blacktailed jack rabbit (<i>Lepus californicus</i>)	Mourning dove (<i>Zenaida macroura</i>)
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	Osprey (<i>Pandion haliaetus</i>)
Botta's Pocket Gopher (<i>Thomomys bottae</i>)	Red-necked phalarope (<i>Phalaropus lobatus</i>)
Brewer's blackbird (<i>Euphagus cyanocephalus</i>)	Redwinged blackbird (<i>Agelaius phoeniceus</i>)
California brown pelican (<i>Pelecanus occidentalis californicus</i>)	Royal tern (<i>Sterna maxima</i>)
California legless lizard (<i>Anniella pulchra</i>)	Sanderling (<i>Calidris alba</i>)
Caspian tern (<i>Sterna caspia</i>)	Sea lion (<i>Zalophus californianus</i>)
Cattle Egret (<i>Bubulcus ibis</i>)	Semipalmated plover (<i>Charadrius semipalmatus</i>)
Coast horned lizard (<i>Phrynosoma coronatum</i>)	Snowy Egret (<i>Egretta thula</i>)
Cottontail rabbit (<i>Oryctolagus cuniculus</i>)	Southern mule deer (<i>Odocoileus hemionus fuliginatus</i>)
Deer Mice (<i>Peromyscus maniculatus</i>)	Spotted Towhee (<i>Pipilo maculatus</i>)
Elegant tern (<i>Sterna elegans</i>)	Swainson's Thrush (<i>Catharus ustulatus</i>)
Eurasian Collared-dove (<i>Streptopelia decaocto</i>)	Toad (<i>Bufo</i> sp.)
Feral pig (<i>Sus scrofa</i>)	Turkey vulture (<i>Cathartes aura</i>)
Forester's tern (<i>Sterna forsteri</i>)	Varied Thrush (<i>Ixoreus naevius</i>)
Fox Sparrow, Sooty ((<i>Passerella iliaca</i>) <i>unalaschensis</i>)	Western fence lizard (<i>Sceloporus occidentalis</i>)
Great-tailed Grackle (<i>Quiscalus mexicanus</i>)	Western meadowlark (<i>Sturnella neglecta</i>)
Golden-crowned Sparrow (<i>Zonotrichia atricapilla</i>)	Western ring-necked snake (<i>Diadophis punctatus amabilis</i>)
Golden eagle (<i>Aquila chrysaetos</i>)	Western sandpiper (<i>Calidris mauri</i>)
Great egret (<i>Ardea alba</i>)	Wilson's Snipe (<i>Gallinago delicata</i>)
Hermit Thrush (<i>Catharus guttatus</i>)	Wilson's Warbler (<i>Cardellina pusilla</i>)
Horned lark (<i>Eremophila alpestris</i>)	Whimbrel (<i>Numenius phaeopus</i>)
House finch (<i>Carpodacus mexicanus</i>)	White crowned sparrow (<i>Zonotrichia leucophrys</i>)
Lompoc Kangaroo rat (<i>Dipodomys heermanni arenae</i>) Glenn Greenwald, pers. comm	White tailed kite (<i>Elanus leucurus</i>)
	Willet (<i>Catoptrophorus semipalmatus</i>)
	Wrentit (<i>Chamaea fasciata</i>)